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The Case | A hypertensive woman with an abnormal abdominal X-ray

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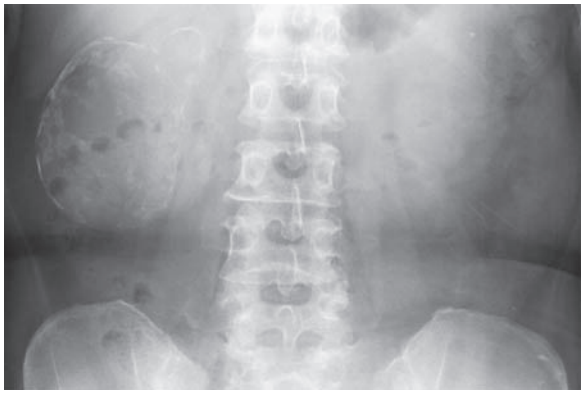

Figure 1 | Abdominal plain film showing an eggshell-like calcification at the right perivertebral area.

A 52-year-old woman was evaluated for right flank discomfort for 2 months and for newly developed hypertension. She had experienced a motor scooter accident with blunt trauma to her right flank 3 years ago. Her family history was unremarkable. On physical examination, her blood pressure was 162/98 mm Hg and pulse rate was 74 per minute. A palpable firm mass over the right costovertebral angle was noted without percussion tenderness. The remainder of her physical examination was unrevealing. Urinalysis revealed mild proteinuria (1 +) without hematuria or pyuria. Laboratory investigations were notable for mild anemia (hemoglobin 11.2 g per 100 ml), hypokalemia (potassium 3.2 mmol/l), high plasma activity of renin (2.3, 0.2–0.7 ng/l/sec) and aldosterone (714.9, 98.9–664.8 mmol/l). Abdominal plain film showed an unexpected huge opaque mass around the right flank region (Figure 1). The use of enalapril (20 mg daily) led to a reduction of blood pressure to 130/80 mm Hg on average.

What is the cause of her hypertension?

SEE NEXT PAGE FOR ANSWERS

The Diagnosis | 'Page kidney' caused by a chronic subcapsular hematoma

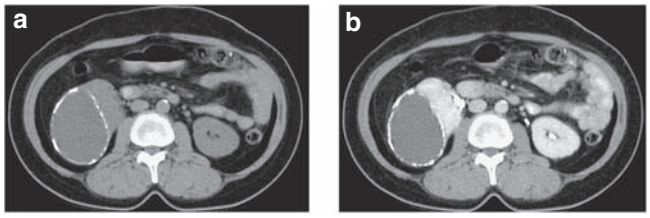

Figure 2 | A Subcapsular renal hematoma is surrounded by a thickened and calcified wall with an apparently compressed right kidney. Computed tomography without (**a**) and with (**b**) contrast.

A solitary renal mass with peripheral rim calcifications on ultrasonography can occur in both benign and malignant conditions, most commonly in renal cysts and neoplasms.[1] Computed tomography can discriminate these underlying causes more precisely and, in this case, showed a huge eggshell-like calcified cystic mass ($6.2 \times 8.5 \times 12.5$ cm) with an internal homogeneous low density and no enhancement adjacent to her right kidney, suggestive of chronic subcapsular organizing hematoma rather than renal malignancies or infections (Figure 2). The hematoma compressed and distorted the right renal parenchyma without hilar involvement. The traumatic history and hypertension associated with a compressed kidney and its excellent response to an angiotensin-converting enzyme inhibitor confirmed the diagnosis of 'Page kidney'.

Page kidney generally refers to hypertension secondary to any external renal compression by acute or chronic processes, first described by Page in 1939 in an animal model of hypertension created by wrapping kidneys in cellophane and clinically in 1955.[2] There are many possible causes. Subcapsular or perinephric hematoma due to traumatic, iatrogenic, or spontaneous hemorrhage accounts for most cases, of which motor vehicle accidents are the leading cause. It is noteworthy that in the last two decades, iatrogenic causes have increasingly resulted from a complicated renal allograft biopsy or lithotripsy. Besides hematoma, non-bleeding etiologies have also been reported, including urinoma, large renal cyst, pararenal, and retroperitoneal lesions.[3,4]

Hypertension, the hallmark of Page kidney, is believed to involve renal hypoperfusion and ischemia, consequently activating the renin–angiotensin–aldosterone system (RAAS). The resultant compression-induced interstitial nephritis may also contribute to the development of hypertension.[5] A concomitant loss of renal function in varying degrees has been reported as another important complication, particularly after a biopsy of kidney allografts or a poorly functioning contralateral kidney. Hypokalemia with renal potassium wasting attributed to concurrent hyperaldosteronism can be present as a consequence of Page kidney.[3,4]

The diagnosis of Page kidney is usually made after imaging. Computed tomography has allowed for an earlier and more accurate diagnosis than ultrasonography, in addition providing excellent views of the retroperitoneal space and a temporal resolution of hematoma. Conservative therapy with RAAS blockade and fluid control is generally sufficient to control associated hypertension, as in our patient.[3] Surgical interventions involving nephrectomy, evacuation of hematoma, and endoscopic or percutaneous drainage of hematoma are reserved for persistent or refractory hypertension, very large hematoma, and deteriorating renal function.[6]

In summary, Page kidney, an important but easily ignored cause of hyperreninemic hypertension, should be considered in the differential diagnosis of secondary hypertension. Use of CT scanning has allowed for earlier and accurate diagnoses. Conservative therapy with RAAS blockade is appropriate if there are no severe complications.

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